

Section III-11 Lighting

Adequate lighting is important to the safe operation of a high volume, higher speed, urban roadway. It allows the driver better visibility and gives them adequate time to make decisions and proper maneuvers so as not to cause conflicts with other drivers.

III-11.01 Warrants For Highway Lighting

III-11.01.1 Freeway Lighting

Continuous freeway lighting is warranted under any one or more of the following:

- i On those freeway sections in and near cities where the current average daily traffic is 30,000 or more.
- i On those freeway sections where three or more successive interchanges, with an average spacing of one and one half (1-1/2) miles, are located, and the adjacent areas are substantially urban in character.
- i where for a length of two or more miles the freeway passes through a substantially developed suburban or urban area in which one or more of the following exists:
 - Local traffic operates on a complete street grid having some form of street lighting, parts of which are visible from the freeway.
 - The freeway passes through a series of developments such as residential, commercial, industrial and civic areas, colleges, terminals, etc., which includes roads, streets, parking areas, yards, etc., that are lighted.
 - Separate cross streets, both with and without connecting ramps, occur with an average spacing of one half (1/2) mile or less, some of which are lighted as part of the local street system
 - The freeway cross section elements, such as median and borders, are substantially reduced in width below desirable sections used in the relatively open country because of high costs of right of way due to proximity of existing land developments.
 - Where the ratio of night to day crash rate is at least 2.0 or higher than the statewide average for all unlighted similar sections, and a study indicates that lighting may be expected to result in a significant reduction in the night crash rate.
 - On those freeway sections between completely lighted interchanges which are located with a spacing of one and one half (1-1/2) miles or less.

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- Where a local government agency finds sufficient benefit in the form of convenience, safety, policing, community promotion, public relations , or otherwise, to pay 50% of the cost of installation of the lighting facilities.

III-11.01.2 Complete Interchange Lighting

Complete interchange lighting is warranted under one or more of the following:

- i The current average daily ramp traffic entering and leaving the freeway within the interchange area exceeds 10,000 for urban conditions, 8,000 for suburban conditions, or 5,000 for rural conditions.
- i Where the current average daily traffic on the cross road exceeds 10,000 for urban conditions, 8,000 for suburban conditions, or 5,000 for rural conditions.
- i Where existing substantial commercial or industrial development, which is lighted at night, is located in the immediate vicinity of the interchange, or where the cross road approach legs are lighted for one half (½) mile, or more, on each side of the interchange.
- i Where the ratio of night to day crash rate within the interchange area is at least 1.5 or higher than the statewide average for all unlighted similar sections, and a study indicates that lighting may be expected to result in a significant reduction in the night crash rate.
- i Where a local government agency finds sufficient benefit in the form of convenience, safety, policing, community promotion, public relations, or otherwise, and to meet the following:
 - Pay 50% of the cost of installation of the lighting facilities.
 - Pay all costs of future maintenance and operations.
 - To install, operate, and maintain adequate lighting on either or both crossroad approaches to the interchange. The crossroad lighting must be continuous between the interchange and an existing street lighting system.

III-11.01.3 Partial Interchange Lighting

Partial interchange lighting, (one or more lights located in the vicinity of the ramp terminal at through traffic lanes and at the crossroad), is warranted under any of the following:

- i Where the current average daily ramp traffic entering or leaving the freeway within the interchange area exceeds 5,000 under urban conditions, 3,000 under suburban conditions, and 1,000 under rural conditions.

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- i Where current average daily traffic on the freeway through traffic lanes exceeds 25,000 for urban conditions, 20,000 for suburban conditions, or 10,000 for rural conditions.
- i Where the ratio of night to day crash rate within the interchange area is at least 1.25 or higher than the statewide average for all unlighted similar sections, and a study indicates that lighting may be expected to result in a significant reduction in the night crash rate.
- i Where a local government agency finds sufficient benefit in the form of convenience, safety, policing, community promotions, public relations, or otherwise, and pay 50% of the cost of installation and all maintenance and operational costs.

III-11.01.4 U.S. and ND Numbered Highways and Urban Streets

Lighting of U.S. and ND numbered highways and urban streets are warranted under one or more the following:

- i Reconstruction of the existing roadway will require the removal of the existing lighting system.
- i Where the ratio of night to day crash experience is 2.0 or higher and a study of the conditions indicates that lighting may be expected to result in a significant reduction in night crash rate.
- i The installation of lighting will add to the safety and comfort of the vehicular driver, the safety of pedestrians, and facilitates traffic flow and /or where a local governmental agency finds sufficient benefit in the form of convenience, safety, policing, community promotion, public relations, or otherwise, and to pay 50% of the cost of installation of the lighting facilities and all the cost of maintenance and operation.

III-11.01.5 Intersections on U.S. and ND Numbered Highways

Lighting of rural intersections and other sites on U.S. and ND numbered highways is warranted under the following:

- i Channelized intersections, constructed by raised islands or by pavement markings.
- i Locations that experience four (4) night time crashes in one (1) year or six (6) or more in two(2) years.
- i Where there have been six(6) or more total crashes in a period of three years or less, and the ratio of night to day crash experience is 1.5 or higher, and a study of the conditions

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indicates that lighting may be expected to result in a significant reduction in the night accident rate.

- i Where engineering judgement, based on a study of operating conditions, and traffic and crash experience, indicates that lighting may be expected to result in a significant benefit to the public.
- i Where a local government agency finds sufficient benefit in the form of convenience, safety, policing, community promotions, public relations, or otherwise, and pay 50 % of the cost of installation and all the costs of maintenance and operation.

III-11.01.6 Additional Lighting

Additional highway lighting facilities may be installed provided the local government agency, or other party, pays the added cost of installation of the additional lighting facilities and pays all costs of future maintenance and operation.

III-11.02 Plans and Specifications

The plans and specifications for all lighting facilities to be installed on or adjacent to state highways, including service roads, constructed under an agreement between the state and a local government agency, are subject to approval by the NDDOT.

III-11.02.1 Breakaway Light Standards

This does not apply to High Mast Lighting.

Breakaway light standards, designed to minimize damage or injury when struck by an errant vehicle, should be specified under the following conditions:

- i All lighting facilities to be used on interstate highways, including crossroad lighting, unless the light standards will be located behind adequate guardrail or bridge rail.
- i All light standards to be installed within 30 feet of the edge of the traveled way, where the 85th percentile speed exceeds 25 mph, with the following exceptions:
 - < When the light standard is located behind a curb or on the far side of a service road. However, an engineering study of the roadside conditions may warrant the installation of breakaway standards.
 - < At the junction of two highways or of a street and highway, provided that no more than two light standards are installed not less than 12 feet from the surfaced shoulder of the highway.

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III-11.03 Reference Material and Computer Programs

- i AASHTO's An Informational Guide for Roadway Lighting
- i National Electric Safety Code
- i American Electric Handbook
- i Illuminating Engineers Society (IES) publication RP-8, Roadway Lighting
- i American Electric Lighting Program for conventional lighting
- i Cala Pro for high mast lighting and sign lighting

III-11.04 Standard Drawings

There are design features that are used over and over and these have been embodied in the following Standards:

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| Concrete Foundations | D-770-1 |
| Feed Point | D-770-2 |
| Combination Feed Point Details | D-770-2A |
| Pull Box Details | D-770-3 |
| Lighting and Signal Details | D-770-4 |
| Light Standard Details | D-770-5 |
| Overhead Sign Lighting Details | D-770-7 |
| High Mast Lighting | D-770-8 |
| | D-770-9 |

These standards can be found On www.state.nd.us under design division standards.